

REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN METEOROLOGY
COLLEGE OF ATMOSPHERIC AND GEOGRAPHIC SCIENCES
 THE UNIVERSITY OF OKLAHOMA

For Students Entering the Oklahoma State System for Higher Education
Summer 2009 through Spring 2010

GENERAL REQUIREMENTS	
Total Credit Hours	125-126*
Total Upper-Division Credit Hours	52
Minimum Retention/Graduation Grade Point Averages:	
Minimum in OU Coursework	2.00
Minimum in Major Coursework- Combined and OU	2.00
Overall - Combined and OU	2.00

Meteorology

B685
 Bachelor of Science
 in Meteorology

OU encourages students to complete at least 32 hours of applicable coursework each year to have the opportunity to graduate in four years.

Year	FIRST SEMESTER	Hours	SECOND SEMESTER	Hours
FRESHMAN	ENGL 1113, Principles of English Composition (Core I)	3	ENGL 1213, Principles of English Composition (Core I), or	3
	⁵ MATH 1823, Calculus & Analytic Geometry I (Core I)	3	EXPO 1213, Expository Writing (Core I)	3
	CHEM 1315, General Chemistry (Core II)	5	⁵ MATH 2423, Calculus & Analytic Geometry II (Core I)	3
	HIST 1483 or 1493, U.S. (Core IV)	3	⁵ *C S 1313, Programming for Non-Majors	3
	METR 1111, Orientation to Professional Meteorology	1	PHYS 1311, General Physics Laboratory I	1
			⁵ PHYS 2514, General Physics for Engr. & Science (Core II)	4
			P SC 1113, American Federal Government (Core III)	3
	TOTAL CREDIT HOURS	15	TOTAL CREDIT HOURS	17
SOPHOMORE	MATH 2433, Calculus & Analytic Geometry III	3	⁵ MATH 2443, Calculus & Analytic Geometry IV	3
	⁵ METR 2011, Intro. to Meteorology I Laboratory	1	⁵ METR 2021, Intro. to Meteorology II Laboratory	1
	⁵ METR 2013, Introduction to Meteorology I	3	⁵ METR 2023, Introduction to Meteorology II	3
	⁵ PHYS 2524, General Physics for Engr. & Science Majors	4	¹ General Education Western Civilization & Culture (Core IV)	3
	PHYS 1321, General Physics Laboratory II	1	² One of the following: AGSC 1013; AGSC 2014; GEOL 1114; ASTR 1504; BOT 1114; CHEM 1415; or ZOO 1114	4-5
	¹ General Education Understanding Artistic Forms (Core IV)	3	¹ General Education Social Sciences (Core III)	3
	TOTAL CREDIT HOURS	15	TOTAL CREDIT HOURS	17-18
JUNIOR	ENGL 3153, Technical Writing	3	ENGR 3723, Numerical Methods for Engr. Computation	3
	⁵ MATH 3413, Physical Mathematics I	3	⁵ METR 3123, Atmospheric Dynamics II: Theory of Atmos. Flows	3
	⁵ METR 3113, Atmospheric Dynamics I: Intro. to Atmospheric Kinematics and Dynamics	3	⁵ METR 3223, Physical Meteorology II: Cloud Physics, Atmospheric Electricity and Optics	3
	⁵ METR 3213, Physical Meteorology I: Thermodynamics	3	³ Math Elective, or approved minor/area of concentration	3
	⁵ METR 3613, Meteorological Measurements	3	⁴ Science Elective, or approved minor/area of concentration	3
	TOTAL CREDIT HOURS	15	TOTAL CREDIT HOURS	15
SENIOR	⁵ METR 4911, Senior Seminar (Capstone)	1	METR 4433, Mesoscale Meteorology	3
	1 of the following 2: METR 4303, Statistical Meteorology, or MATH 4753, Applied Statistical Methods	3	METR 4922, Senior Seminar II (Capstone)	2
	⁵ METR 4133, Atmospheric Dynamics III: Mid-Latitude Synoptic-Scale Dynamics	3	Meteorology, Hydrology or Climatology Elective	3
	⁵ METR 4233, Physical Meteorology III: Radiation & Climate	3	⁴ Science Elective, or approved minor/area of concentration	3
	⁵ METR 4424, Synoptic Meteorology Laboratory	4	⁴ Science Elective, or approved minor/area of concentration	3
	¹ General Education Non-Western Culture (Core IV)	3		
	TOTAL CREDIT HOURS	17	TOTAL CREDIT HOURS	14

* Students who have not completed two years of the same foreign language in high school are required to take two college courses in the same foreign language. This additional coursework may add 6-10 hours to the minimum hours required for graduation.

¹ To be chosen from the University-Wide General Education Approved Course List for Core III (Social Science) and Core IV (Humanities). **At least three hours must be upper-division outside the major.**

² AGSC 1013 or 2014 fulfills a College of Atmospheric and Geographic Sciences requirement for a geography course. **If AGSC 1013 or 2014 is not taken, a faculty-adviser-approved science course in geography must be taken.**

³ An upper-division math course. May be exchanged for a course in an area of concentration or approved minor (see reverse side).

⁴ Minimum of nine upper-division hours of faculty-adviser-approved science courses in geography, geology, geophysics, engineering, math, physical sciences and/or biological sciences or faculty-adviser- approved courses in a minor or area of concentration. If AGSC 1013 or 2014 is not taken, three hours must be in geography.

⁵ **Students must attain a grade of C or better in all MATH, PHYS, C S, and METR courses that are direct prerequisites for METR courses. Please see reverse side for these prerequisites.**

* This course fulfills the Computer Literacy Requirement for graduation as required by the Oklahoma State Regents for Higher Education.

NOTE: No more than 52 hours of Meteorology coursework may be taken to fulfill the 125-126 minimum credit hours required.

University-Wide General Education Requirements (minimum 40 hours)

Courses designated as Core I, II, III, IV, or Capstone are part of the General Education curriculum. Students must complete a minimum of 40 hours of General Education courses, chosen from the approved list, including at least one upper-division Gen. Ed. course outside of the student's major. Courses graded S/U or P/NP will not apply.

Core I	Symbolic and Oral Communication (9-19 hours, 3-5 courses) • English Composition—6 hours, 2 courses • Mathematics—3 hours, 1 course • Foreign Language—0-10 hours, 2 courses in the same language, (can be met by successfully completing 2 years of the same foreign language in high school) • Other (courses such as communication, logic or public speaking)
Core II	Natural Science (7 hours, 2 courses) • Courses must be taken from different disciplines in the biological and/or physical sciences; one of which must include a laboratory.
Core III	Social Science (6 hours, 2 courses) • One course must be P SC 1113, "American Federal Government"
Core IV	Humanities (12 hours, 4 courses) • Understanding Artistic Forms—3 hours, 1 course • Western Civilization and Culture—6 hours, 2 courses, including HIST 1483 or HIST 1493 • Non-Western Cultures—3 hours, 1 course

Senior Capstone Experience (3 hours, 1 course) Note: Meteorology requires two courses for completion of the Capstone Experience, METR 4911 and METR 4922.

AREA OF CONCENTRATION IN COMPUTER SCIENCE

The School of Meteorology has joined with the School of Computer Science in the College of Engineering to provide an Area of Concentration within the meteorology curriculum for students interested in further developing their skills in the use of computers in science, engineering, and business. Additional information is available from your faculty adviser.

MINOR IN BROADCAST METEOROLOGY

The College of Journalism and Mass Communication offers a minor in Broadcast Meteorology for meteorology majors interested in careers in broadcast media. **Sixteen hours in communication and journalism courses are required.** Additional information is available from your faculty adviser.

MINORS IN MATHEMATICS, BUSINESS, CHEMISTRY, COMPUTER SCIENCE, ENVIRONMENTAL SCIENCE, GEOGRAPHY, GEOLOGY, HYDROLOGIC SCIENCE, INTERDISCIPLINARY PERSPECTIVES ON THE ENVIRONMENT, AND PHYSICS

“Official” minors in mathematics, business, chemistry, computer science, environmental science, geography, geology, hydrologic science, interdisciplinary perspectives on the environment, and physics are available and students are encouraged to consider one or more of these minors. Students may obtain a minor in mathematics by taking one more math course in addition to those required in the curriculum. Additional information is available from your faculty adviser or from the Atmospheric and Geographic Sciences Dean’s Office, National Weather Center, Room 4600.

COURSES IN COMPUTER SCIENCE (C S)

1313 Programming for Nonmajors. Prerequisite: Mathematics 1523 or equivalent. Introduction to the design and implementation of computer programs. Emphasis on problem solving. (F, Sp)

COURSES IN ENGINEERING (ENGR)

†G3723 Numerical Methods for Engineering Computation. Prerequisite: 1112, 1001 or Computer Science 1313 or 1323, and Mathematics 3113. Basic methods for obtaining numerical solutions with a digital computer. Included are methods for the solution of algebraic and transcendental equations, simultaneous linear equations, ordinary and partial differential equations, and curve fitting techniques. The methods are compared with respect to computational efficiency and accuracy. (F, Sp, Su)

COURSES IN MATHEMATICS (MATH)

1823 Calculus and Analytic Geometry I. Prerequisite: 1523 at OU, or satisfactory score on the placement test, or satisfactory score on the ACT/SAT. Topics covered include equations of straight lines; conic sections; functions, limits and continuity; differentiation; maximum-minimum theory and curve sketching. A student may not receive credit for this course and 1743. (F, Sp, Su) [I-M]

2423 Calculus and Analytic Geometry II. Prerequisite: 1823. Integration and its applications; the calculus of transcendental functions; techniques of integration; and the introduction to differential equations. A student may not receive credit for this course and 2123. (F, Sp, Su) [I-M]

2433 Calculus and Analytic Geometry III. Prerequisite: 2423. Polar coordinates, parametric equations, sequences, infinite series, vector analysis. (F, Sp, Su)

2443 Calculus and Analytic Geometry IV. Prerequisite: 2433. Vector calculus; functions of several variables; partial derivatives; gradients, extreme values and differentials of multivariate functions; multiple integrals; line and surface integrals. (F, Sp, Su)

†G3413 Physical Mathematics I. Prerequisite: 2443 or concurrent enrollment. Complex numbers and functions. Fourier series, solution methods for ordinary differential equations and partial differential equations, Laplace transforms, series solutions, Legendre’s equation. Duplicates two hours of 3113. (F)

G4753 Applied Statistical Methods. Prerequisite: 2123 or 2423 or permission of instructor. Estimation, hypothesis testing, analysis of variance, regression and correlation, goodness-of-fit, other topics as time permits. Emphasis on applications of statistical methods. (F, Sp, Su)

COURSES IN METEOROLOGY (METR)

1111 Orientation to Professional Meteorology. Prerequisite: Mathematics 1503 or higher. Required of all Meteorology majors during their first year of residence. Introduction to the School of Meteorology and its curriculum, faculty and staff. Presentations from different professional meteorologists introduce career options, challenges and opportunities in meteorology. (F)

2011 Introduction to Meteorology I Laboratory. Prerequisite: Grade of C or better in Mathematics 1823; corequisite: 2013, Computer Science 1313 or 1323, Mathematics 2423, and Physics 2514 or 1205. Reinforces the theoretical concepts provided in the counterpart lecture course Meteorology 2013, which introduces students to important phenomena and physical processes that occur in the earth’s atmosphere. Through a series of laboratory exercises, students will learn the basic concepts and tools that are used to study atmospheric problems. Special emphasis will be placed on developing information technology and computational skills. The laboratory exercises target the topics covered in the lecture component. (F, Sp)

2013 Introduction to Meteorology I. Prerequisite: Mathematics 1823 (C or better); corequisite: 2011, Computer Science 1313 or 1323, Mathematics 2423, Physics 2514 or 1205. Introduces students to important phenomena and physical processes that occur in earth’s atmosphere, as well as to the basic concepts and instruments used to study atmospheric problems. Focuses on atmospheric radiation, thermodynamics, moisture, stability, clouds, and precipitation. (F, Sp)

2021 Introduction to Meteorology II Laboratory. Prerequisite: Grade of C or better in 2011 and 2013, Computer Science 1313 or 1323, Mathematics 2423, and Physics 2514 or 1205. Corequisite: 2023, Mathematics 2433, and Physics 2524 or 1215. Reinforces the theoretical concepts provided in the counterpart lecture course Meteorology 2023, which introduces students to important phenomena and physical processes that occur in the earth’s atmosphere. Through a series of laboratory exercises, students will learn the basic concepts and tools that are used to study atmospheric problems. Special emphasis will be placed on developing information technology and computational skills. The laboratory exercises target the topics covered in the lecture component. (Sp, Su)

2023 Introduction to Meteorology II. Prerequisite: Grade of C or better in 2011 and 2013, Computer Science 1313 or 1323, Mathematics 2423, Physics 2514 or 1205; corequisite: 2021, Mathematics 2433, and Physics 2524 or 1215. Introduces students to important phenomena and physical processes that occur in earth’s atmosphere. Students will learn the basic concepts and instruments used to study atmospheric problems. Part II of the introduction to meteorology sequence focuses on atmospheric dynamics, wind systems of different origin and scale, and thunderstorms. It also addresses boundary layer meteorology, air pollution, forecasting and climate change. (Sp, Su)

†G3113 Atmospheric Dynamics I: Intro to Atmospheric Kinematics/Dynamics. Prerequisite: Grade of C or better in 2023 and 2021, Mathematics 2443, and Physics 1215 or 2524. Characterization of the atmosphere mathematically, the study of forces acting upon it, and approximations used. Topics include Newton’s laws of motion; energy, equilibrium and stability; coordinate systems and forces; the equations of motion and simple force balances; and mass and energy conservation. (F)

†G3123 Atmospheric Dynamics II: Theory of Atmospheric Flows. Prerequisite: Grade of C or better in 3113, 3213, and MATH 3113 or 3413. Continuation of the study of atmospheric dynamics and kinematics begun in Dynamics I. Topics include: natural coordinates, geostrophic wind, inertial flow, cyclostrophic flow, gradient wind, thermal wind, kinematics and dynamics of circulation and vorticity, viscosity, and stress; turbulence, structure, and dynamics of the atmospheric boundary line. (Sp)

3213 Physical Meteorology I: Thermodynamics. Prerequisite: grade of C or better in 2023 and 2021, Mathematics 2443, and Physics 1215 or 2524. This course introduces the physical processes associated with atmospheric composition, basic radiation and energy concepts, the equation of state, the zeroth, first and second law of thermodynamics for dry and moist atmospheres, thermodynamic diagrams, statics, and atmospheric stability. (F)

†G3223 Physical Meteorology II: Cloud Physics, Atmospheric Electricity and Optics. Prerequisite: Grade of C or better in 3113, 3213, Mathematics 3113 or 3413. Cloud and precipitation processes including the role of aerosols in cloud droplet and ice nucleation, growth of cloud particles into rain, snow, and hail by diffusion, coalescence, and cloud aggregation; the Clausius-Clapeyron equation; application of cloud physics in cloud electrification and optical phenomena in the atmosphere; concepts of weather radar. (Sp)

†G3613 Meteorological Measurement Systems. Prerequisite: Grade of C or better in 2023 and 2021, Mathematics 2443, and Physics 1215 or 2524. Introduces the physical principles of meteorological instruments, discusses static and dynamic sensor performance, and explores the concepts of meteorological instruments, and to identify sensor limitations and major error sources. Furthermore, basic procedures of data analysis will be discussed. **Laboratory (F)**

G4133 Atmospheric Dynamics III: Mid-Latitude Synoptic-Scale Dynamics. Prerequisite: Grade of C or better in 3123 and 3223. Concepts from kinematics, dynamics and thermodynamics used to characterize synoptic-scale atmosphere, emphasis on quasi-geo strophic and baroclinic instability theory as basis for understanding extra-tropical weather systems including cyclones, fronts and jets. Linear theory is used to describe a variety of atmospheric waves and their role in synoptic-scale meteorology. (F)

G4233 Physical Meteorology III: Radiation and Climate. Prerequisite: Grade of C or better in 3123 and 3223. Fundamental principles of radiation; absorption and emission of radiation; solar and terrestrial radiation; radiative transfer and heating rates; surface and global energy balances; atmospheric general circulation; natural climate variations; greenhouse climate change; stratospheric ozone depletion. (F)

G4303 Statistical Meteorology. Prerequisite: Grade of C or better in Mathematics 2423, Computer Science 1313 or Computer Science 1323. Offers specialized topics in statistical meteorology such as the role of probability and statistics in decision making, interplay between experimental design and the physics of an underlying problem, sampling techniques, graphical presentation of data and model building. Emphasis will be placed on computational aspects for meteorological data. (F)

G4424 Synoptic Meteorology Laboratory. Prerequisite: Grade of C or better in 3123 and 3223. This course is a lecture/laboratory course designed to provide students a physical understanding of atmospheric principles. Students are challenged to explain theoretical concepts and to demonstrate a mastery in understanding various physical processes including the theory and practice of weather analysis and forecasting, surface and upper air analysis, fronts and wave cyclones, satellite meteorology, sounding analysis, thermodynamic diagram, cross sections, forecasting, NMC models, MOS, radar meteorology, and severe weather. Communications skills are emphasized. (F)

G4433 Mesoscale Meteorology. Prerequisite: Grade of C or better in 4133, 4424. Structure and dynamics of convective and mesoscale phenomena including: mesoscale convective systems, severe thunderstorms, tornadoes, low-level jets, mountain waves and hurricanes. Discussion of the general behavior, characteristics, and dynamics of the formation and development of these phenomena, and the types of weather and hazards they produce. (Sp)

G4613 Satellite Meteorology. Prerequisite: Grade of C or better in 3123, 3223. Survey of satellite meteorology and climatology. History of meteorological satellites, radiation, orbital mechanics, satellite systems and data processing, basic image interpretation, cloud-drift winds, precipitation, temperature soundings, tropical cyclone, mesoscale, and synoptic-scale analysis and forecasting, cloud, water vapor and precipitation climatology, radiation budget. **Laboratory (Irreg.)**

G4624 Radar Meteorology. Prerequisite: Grade of C or better in 3223, 3613, Mathematics 3413 or 3113. Develops quantitative relationships between physical characteristics of targets illuminated by a pulse of electromagnetic energy and the quantities measured by weather radar. Capabilities and limitations of radar designs are studied relative to meteorological applications. Doppler principles, including interpretation of data, are provided. Polarimetric and phased array radar are introduced. Experience is gained in hands-on exercises with weather radars and computer based labs. (Sp)

G4633 Hydrometeorology. Prerequisite: Grade of C or better in 3123, 3223 or permission of instructor. Interdisciplinary emphasis on mesoscale precipitation processes, applications of new hydrometeorological observing systems, and on the interactions between meteorology and hydrology during flood events. (Irreg.)

4911 Senior Seminar (Capstone). Prerequisite: Grade of C or better in 3123, 3223. With 4922, satisfies Capstone course requirement. The instructor will guide senior meteorology majors through planning of a research project. Interdisciplinary topics are encouraged and library work will be required. Students will be paired with regular or adjunct faculty mentors. Senior doctoral students may serve as mentors with permission from the instructor. The result of 4911 will be a mini-proposal which will serve as a guide for the senior research project. In addition, the instructor may present professional skills useful during job search, early employment, and graduate school application and attendance. Note that METR 4922 should be taken following this course. (F, Sp) [V]

4922 Senior Seminar II (Capstone). Prerequisite: Grade of C or better in 3123, 3223, 4911. With 4911, satisfies the Capstone course requirement. The instructor will guide students as they follow the research plan established in the mini-proposal completed in METR 4911. Library work will continue to be required with development of research methodology and analysis of results. Students will continue to work with faculty (senior doctoral student) mentors. The culmination of the two-course Capstone sequence will be a written and oral presentation of the senior thesis. The skills learned in Capstone I and II will be useful whether the student is employed in academia, government, or the private sector. (F, Sp) [V]